

CLAIMS

1. Apparatus for the measurement of skeletal joint motion in a subject comprising:

5 (a) a passive motion device which comprises a horizontal platform base and a horizontal passive motion platform composed of a horizontal static platform which is rigidly connected to the upper lateral surface of the platform base and a horizontal laterally movable platform which is flexibly connected to the static platform or to the upper surface of the platform base, in which the  
10 static platform is adjacent to the laterally movable platform which together both form the passive motion platform, in which the movement of the laterally movable platform is driven by a motor attached to the platform base where movement of the laterally movable platform is achieved by means of a control arm that operably connects the laterally moveable platform to the motor;

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(b) an imaging device;

(c) a processing system which comprises a computer incorporating a means for real time digital sampling of images of the moving joints, means for  
20 recording time code and data from the passive motion platform; means for storage of these images at high resolution; means for recognising templates attributed to individual bones and tracking these automatically using cross-correlation functions; and means for geometric transformation of the positional data to graphically display their relative motion over time

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2. Apparatus as claimed in claim 1, in which the laterally movable platform is situated on a support which lies on the upper surface of the platform base.

3. Apparatus as claimed in claim 1 or in claim 2, in which the imaging device is  
30 an X-ray tube and image intensifier with dosage control.

4. Apparatus as claimed in claim 1 or in claim 2, in which the imaging device is a magnetic resonance scanner.
5. A method for the automated measurement of the relative motion of skeletal structures *in vivo*, comprising the steps of:
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- (i) positioning the subject on a passive motion device as defined in any of claims 1 to 4;
  - (ii) initiating the imaging procedure of the subject positioned on the passive motion device and collecting image data using an imaging device;
  - 10 (iii) sampling the data collected by the imaging device into the processing system and superimposing time code on the images;
  - (iv) tracking templates marked on individual bone segments at the start of the motion sequence;
  - 15 (v) transforming the results of tracking to reflect the changing spatial relationship between image segments; and
  - (vi) presenting the output in graphical form.
- 20 6. A method according to claim 5, in which a calibration step is carried out prior to the method steps (i) to (vi).
7. A method according to claim 5 or claim 6, in which the relative motion of lumbar vertebrae L3 to L3, L3 to L4 and L4 to L5 are tracked simultaneously or separately.
- 25 8. A method for the diagnosis of a pseudoarthrosis in a subject, the method comprising analysing the relative motion of skeletal structures in the patient according to a method of any one of claims 5 to 7.